REMARKS

Upon entry of the present amendment, claims 1-2, 7-19 and 21-23 will remain pending in the above-identified application and stand ready for further action on the merits.

Claims 1-2, 8-9 and 12-13 have been amended herein. Claim 20 has been cancelled.

No new matter is being introduced by the present amendments to the claims. For example, the amendment to claims 1 and 2 find support at page 6, lines 28-31 and page 11, lines 1-2 of the specification.

Proper consideration of each of the pending claims (i.e., claims 1-2, 7-19 and 21-23) is respectfully requested at present, as is entry of the present amendment.

Claim Objections

At page 2 of the Office Action, claims 1, 2, 8, 9, 12 and 13 have been objected to because "flex density" should be "flux density" in the claims. Upon entry of the current amendments to claims 1, 2, 8, 9, 12 and 13, the objections have been rendered moot. Thus, Applicants respectfully request that the Examiner withdraw this objection.

Claim Rejections under 35 USC § 103(a)

Claims 2 and 11-14 have been rejected under the provisions of 35 USC § 103(a) as being obvious and unpatentable over Cooper US '240 (US 6,855,240), which is previously cited as US publication 2003/0209295, in view of Lowenheim (Lowenheim text *Electroplating*), Komura US '897 (US 5,575,897) and Chen US '507 (US 6,876,507). Claims 1, 7-10, 15-20, 22 and 23 have been rejected under the provisions of 35 USC § 103(a) as being obvious and unpatentable

over Cooper US '240 in view of Lowenheim, Komura US '897, Chen US '507 and Geus US '792 (US 4,869,792). Further, claim 21 has been rejected under the provisions of 35 USC § 103(a) as being obvious and unpatentable over Cooper US '240 in view of Lowenheim, Komura US '897 and Chen US '507, further in view of Geus US '792, additionally in view of Andricacos US '927 (US 5,582,927). Each of these rejections is respectfully traversed and reconsideration and withdraw thereof is respectfully requested based on the following considerations.

Features of the Present Invention

As recited in independent claims 1 and 2, the present invention has steps of "effecting electroplating by conducting pulse current across the anode and the workpiece with a pulse current density of 75 to 300 mA/cm^2, a pulse duration of 0.01 to 0.1 second, and a duty ratio of 0.01 to 0.5 to form a film on the work piece" and "heat treating the film at a temperature of 100 to 550°C".

According to the present invention, a soft magnetic thin film of a cobalt-iron alloy is prepared without a substantial drop of saturation flux density from that which would be theoretically predicted. That is, a soft magnetic thin film having a high saturation flux density can be prepared in an efficient manner. Heat treatment of the film following deposition converts the film into a desired soft magnetic thin film having a high saturation flux density of at least 2.3 T, especially at least 2.35 T, more especially about 2.4 T and even a low coercivity, such as "7" Oe in Examples 6 and 7, especially "5" Oe in Example 8, all at the same time.

Both of the first and second embodiments of the present invention (independent claims 1 and 2) comprise the steps of "effecting electroplating by conducting pulse current" and "heat treating the film". These steps are necessary for preparing an electroplated soft magnetic thin film of a cobalt-iron alloy having a higher saturation flux density and a lower coercivity. Further, the specific pulse duration (0.01 to 0.1) and the specific duty ratio (0.01 to 0.5) are also features of the present invention.

Distinction over Cooper US '240

Cooper US '240 disclose or suggest neither the specific pulse current density, the specific pulse duration nor the specific duty ratio, which are the features of the present invention, as recited in independent claims 1 and 2.

Distinction over the Lowenheim Reference

The Lowenheim reference merely teaches about Faraday's laws (see pages 12-13), and discloses the use of an anode bag or a diaphragm on electroplating. However, the Lowenheim reference fails to disclose or suggest specific steps, i.e., electroplating step by conducting pulse current of the present invention.

Further, the Lowenheim reference also fails to disclose or suggest the specific pulse current density, the specific pulse duration and the specific duty ratio, which are the features of the present invention, as recited in independent claims 1 and 2.

Distinction over Komura US '897

Komura US '897 discloses only current density. Komura US '897 describes a plate-forwarding current I_1 and a reverse d.c. bias current I_2 as currents for plating. However, Komura US '897 fails to disclose or suggest the specific pulse duration and the specific duty ratio of the present invention. Komura US '897 merely discloses a soft magnetic thin film as a multilayer film which comprises re-dissolution effect layers and soft-magnetic film layers. The soft-magnetic film layers are magnetically isolated from each other. In this method, each magnetically isolated layer is formed during conduction of the plate-forwarding current I_1. To form the layer which is isolated magnetically, it is necessary to conduct the plate-forwarding current I_1 with a sufficiently long duration time. Furthermore, the duration time of I_1, shown in Figure 1 of Komura US '897, is longer than I_2. That is, duty ratio of Komura US '897 is more than 0.5.

On the other hand, the term of "pulse" usually includes not only meaning of "intermittent" but also meaning of "brief". In the present invention, the pulse duration is 0.01 to 0.1 second and the duty ratio is 0.01 to 0.5.

Accordingly, the currents I_1 and I_2 of Komura US '897 are distinguished from the pulse current of the present invention. Particularly, in view of duty ratio, the present invention is distinguished from the cited reference.

Distinction over Chen US '507

Chen US '507 discloses annealing at an elevated temperature in an external magnetic field along easy axis to reduce H_c. However, Chen US '507 fails to disclose a cobalt-iron alloy which consists essentially of 30 to 50 at% of cobalt and 50 to 70 at% of iron made by electroplating. Only nickel-iron alloy layer is made by electroplating, and cobalt-iron-X (CoFeX) alloy is made by sputtering. In this case, the CoFeX alloy is merely a seed layer, so most of the magnetic film is nickel-iron alloy. Moreover, the CoFeX alloy includes third component X selected from a group comprising nickel, nitrogen, rhodium, aluminum and tantalum.

Further, Chen US '507 fails to disclose or suggest the specific pulse duration and the specific duty ratio of the present invention.

Distinction over Geus US '792

Geus US '792 discloses the use of a membrane. However, Geus US '792 fails to disclose or suggest the specific steps, i.e., electroplating step by conducting pulse current of the present invention. Particularly, Geus US '792 merely discloses a method of supported catalysts by means of an electrochemical reaction. This electrochemical reaction is not electroplating of the present invention for thin film. In a method of Geus US '792, the precipitate is suspended and the current is conducted by cathode which was prepared apart from the precipitate. In the present invention, the workpiece is used as cathode and the magnetic thin film is formed on the workpiece.

Further, Geus US '792 fails to disclose or suggest the specific pulse duration and the specific duty ratio of the present invention.

Distinction over Andricacos US '927

Similar to the other cited references, Andricacos US '927 also fails to disclose or suggest the specific pulse duration and the specific duty ratio of the present invention.

Combination of the Cited References

A prima *facie case* of obviousness is not established even if the cited references are combined, since none of the cited references disclose or suggest the specific pulse duration and the specific duty ratio of the present invention like that recited in each of independent claims 1 and 2. Likewise, it follows that a person having ordinary skill in the art would not be motivated by any of the teachings of the cited references to arrive at the method for preparing an electroplated soft magnetic thin film of the present invention as instantly recited in independent claims 1 and 2, based on the failure of the cited art to teach anything about the specific pulse duration and the specific duty ratio.

Accordingly, the present invention (independent claims 1, 2 and other depending claims) is not obvious over the cited references.

CONCLUSION

Based upon the amendments and remarks presented herein, the Examiner is respectfully requested to issue a Notice of Allowance clearly indicating that pending claims 1-2, 7-19 and 21-23 are allowed and patentable under Title 35 of the United States Code.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Gerald M. Murphy, Jr. (Reg. No. 28,977) at the telephone number below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

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Respectfully submitted,

By _____

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